Chapter 3 Logical Reasoning and Methods of Proof

3-1 Implications and Proofs

Synthetic Proof-a proof built using a system of postulates and theorems in which the properties of figures are studied (*not the actual measurements*) ***Postulates and theorems are listed on pages 668-671.***

Implication- if-then statement (If A, then B.)

Ex) If a piece of fruit is an orange, then it is round.

p🡪q “p implies q” (If p is true, then q is true.)

Converse- If q, then p.

Ex) If a piece of fruit is round, then it is an orange.

Not necessarily true.

Inverse- If not p, then not q.

Ex) If a piece of fruit is not an orange, then it is not round.

Not necessarily true.

Contrapositive- If not q, then not p.

Ex) If a piece of fruit is not round, then it is not an orange.

\*\*\*The contrapositive is the logical equivalent to an implication.

EX) Given quadrilateral ABCD with sides AD and BC parallel and congruent. To prove that ABCD is a parallelogram.

Properties of Quadrilaterals

A quadrilateral is simply a four-sided polygon.

1. Sum of the interior angles is 360 ⁰

A trapezoid is a quadrilateral with *at least* (we’ll talk about it more in 3-3) one pair of parallel sides.

1. Isosceles if the legs are congruent

A kite is a quadrilateral with two pairs of consecutive, congruent sides.

1. Diagonals are perpendicular

A parallelogram is a quadrilateral with two pairs of parallel sides.

1. Opposite sides congruent.
2. Opposite angles are congruent.
3. Diagonals bisect each other. (bisect—divides into two congruent sections.)
4. Consecutive angles are supplementary.

A rhombus is a parallelogram with four congruent sides.

1. Diagonals are perpendicular bisectors of each other. (perpendicular bisectors--90⁰ angles and bisect)

A rectangle is a parallelogram with four congruent, right angles.

1. Diagonals are congruent.

A square is a regular parallelogram (four congruent sides; four congruent angles.)

ALL OF THE ABOVE! (parallelograms on…)

All squares are rectangles, rhombuses, and parallelograms.

As an implication…If a quadrilateral is a square, then it is a (rectangle/rhombus/parallelogram).

In this case, the converse is not necessarily true!

(If a quadrilateral is a (rectangle/rhombus/parallelogram), then it is a square.)

A rhombus is a kite. A kite is not necessarily a rhombus.